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MEASUREMENT NEWS

HORMAN ASSOCIATES, INC.

APRIL 1964

MEASURE 1–15 GC WITH COUNTER ACCURACY

Frequencies from 1 to 15 gc can now be read directly and with extreme accuracy, using the new HP 2590A Microwave Frequency Converter (lower unit shown above) with your electronic counter.

You can use the new Hewlett-Packard Model 2590A Microwave Frequency Converter to determine frequencies from 1 to 15 gc with unprecedented precision. Compatible with four popular HP electronic counters,* the Converter phase locks its internal transfer oscillator to the measured frequency — meaning measurements have an accuracy equal to that of the counter time base ($5/10^{10}$ short term, $3/10^{9}$ per day for the HP 5245L Counter shown above); for even greater accuracy, an external frequency standard can be used. The positive synchronization afforded by automatic phase control also permits you to measure (and record) drift and jitter over long periods. An electronic search oscillator eases capture of the measured frequency.

Other modes of Converter operation let you measure pulsed signals, analyze pulse characteristics, and measure fm and am (even on rapidly drifting signals). Ask us for the details on this unique new solid state unit, priced at $1900.

* Use HP Model 524C or 524D counter equipped with 525C plug-in; Model 5243L or 5245L counter with 5253A or 5253B plug-in.

NOW GET FAST PULSES – EVEN TO 100 MC AND UP!

It's easy when you tie the Hewlett-Packard 10451A Multipulser to the output of your HP Model 215A Pulse Generator (basic range: 100 cps to 1 Mc). The Multipulser splits an input pulse into four equal amplitude pulses, delays them with respect to one another by using cables, and then recombines them to produce a pulse burst simulating a high repetition rate. Using the Multipulser with the 215A, you can simulate rep rates from 15 to 200 Mc, at amplitudes of 2½ to 5 volts. Multipulser price, including four cables, is a modest $95.

WHERE IS "NEW IDEAS"?

So . . . your keen eyes noticed that we've changed the name of this publication! Starting with this issue, MEASUREMENT NEWS officially replaces the interim name NEW IDEAS. *Measurement is our business*, and we feel the new name will serve as a better reminder of that fact. Hope you agree.

X-Y RECORDERS

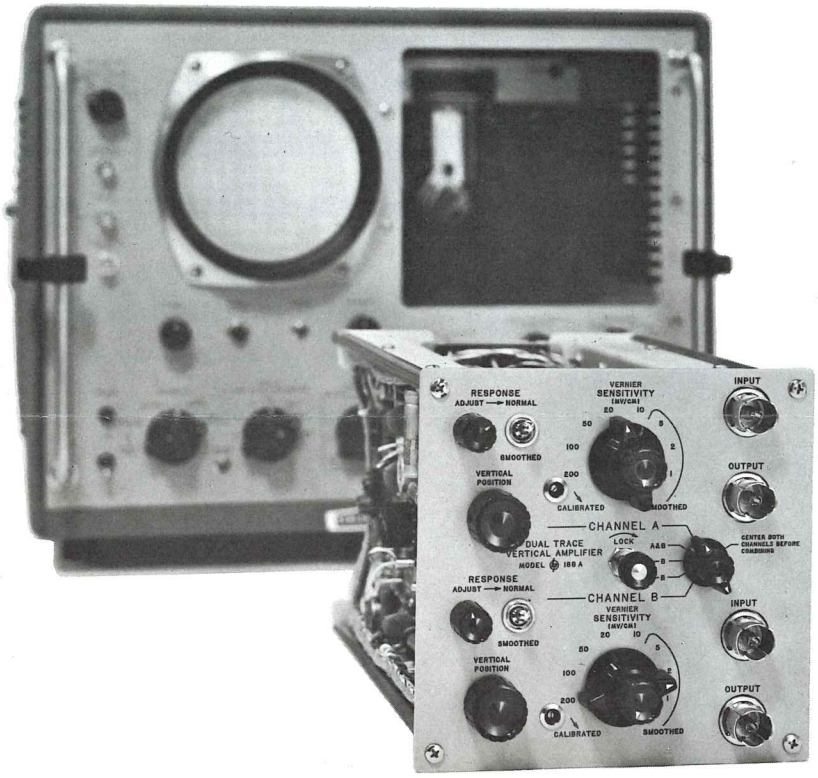
Recording instruments are essential for many an engineering and research project, since they produce permanent records of component or system performance for later analysis, comparison, and reference. Among the most useful such instruments are the well-known X-Y recorders—which plot the relationship between a dependent and an independent variable directly in cartesian coordinates.

In addition to conventional curve-drawing, X-Y recorders can perform special tasks. A short magazine article recently authored by Bruce Hall of F. L. Moseley touches upon such things as *point plotting*, *logarithmic conversion*, and *curve following* (which converts recorders to readout devices). The article also has brief application stories about X-Y recorders used in *vibration testing*, *transducer calibration*, *precision gaging*, *potentiometer testing*, and *servovalve testing*.

For a reprint of this idea-provoking article, just use the reply card enclosed for your convenience.

WATCH 90-PICOSECOND R.T. PULSES PASS BY

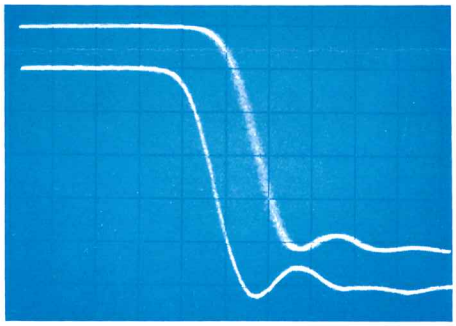
New sampling scope plug-in monitors low level 4 gc signals—without attenuation



Model 188A Dual Trace Vertical Amplifier with Model 185B Sampling Oscilloscope

A new dual trace plug-in amplifier for Hewlett-Packard Model 185A and 185B Sampling Oscilloscopes now makes it possible for you to view fast, 90-picosecond rise time pulses without attenuating or disturbing them. Test signals entering an INPUT terminal of the plug-in (Model 188A) travel right through a 50-ohm line to the OUTPUT terminal of that channel; signals at the OUTPUT then either continue on to an external test circuit or are terminated with a 50-ohm load. Inside the plug-in, a high impedance bridging sampler monitors instantaneous signal voltage with a calibrated sensitivity as high as 1 mv/cm. Both channels have bridging samplers, permitting you to simultaneously observe signal input and output of transmission lines, semiconductors or other devices. For convenient circuit probing, several resistive dividers are available to increase the input impedance.

The faster-than-90-picosecond rise time of the Model 188A is specified at 100% sampling efficiency (amplitude reaches final value in one sample); however, rise times as fast as 50 picoseconds have been observed at lower sampling efficiences, permitting full coverage to 7 gc!



Typical step response of Model 185B Sampling Scope equipped with Model 188A plug-in: (upper) 80 ps at 100% sampling efficiency; (lower) 50 ps at 20% efficiency. Sweep speed, 50 ps/cm.

We'll be delighted to send you detailed information about the HP Model 188A plug-in ($1500) and its parent oscilloscope, the Model 185B.

BOONTON RADIO DEVICE MEASURES PEAK POWER UP TO 2 GC, DOWN TO 10 MW

A new version of the **BOONTON RADIO** Peak Power Calibrator has an extended frequency range covering 50 to 2000 Mc. The Type 8900B Calibrator can measure true peak power down to 10 milliwatts, with an absolute accuracy of ± 0.6 db. Measurement is independent of repetition rate and pulse width (>0.25 μsec), and there are provisions for pulse monitoring. The Type 8900B is priced at $485, and has a basic accuracy of ± 1.5 db; a custom calibration curve ($75) brings the accuracy to ± 0.6 db.

TAKE YOUR CHOICE OF COUNTER OUTPUT OPTIONS

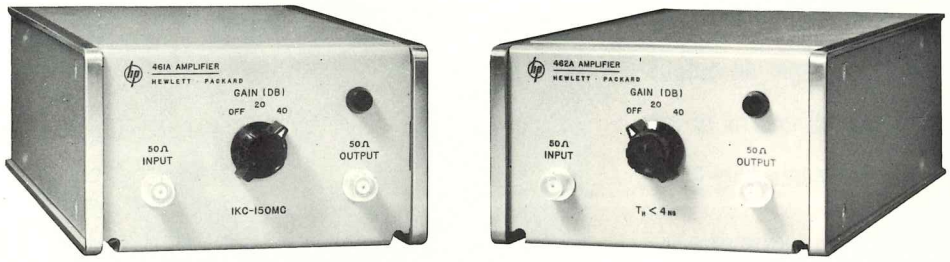
Hewlett-Packard solid state counters come equipped with a 4-line Binary Coded Decimal output, so that the visually displayed information can be recorded or used in some other manner. The standard output is 1-2-2-4 BCD; "1" state positive with respect to the "0" state. Please be reminded, however, that each of these counters can be equipped with a 1-2-4-8 BCD output, at levels the same as the 1-2-2-4 code. The cost is an additional $10 per decade (e.g. 5245L, + $80). For 1-2-4-8 code with "1" state *negative*, add $10 per decade plus a $15 one-time special handling charge.

USE THESE NEW SWEEPERS FOR X-BAND COVERAGE

In our February issue, we described the new, easy-to-use HP 690 Series Sweep Oscillators covering 1 to 4 gc. Now, two more sweepers in the series are available for delivery: Model 693A for swept frequencies from 4 to 8 gc, and Model 694A for 8 to 12.4 gc. Each instrument provides two sweeps between adjustable end points and one sweep about a selected center frequency, and is priced at $3,300. Other 690 Series Sweepers (to 40 gc) will be announced when available for delivery.

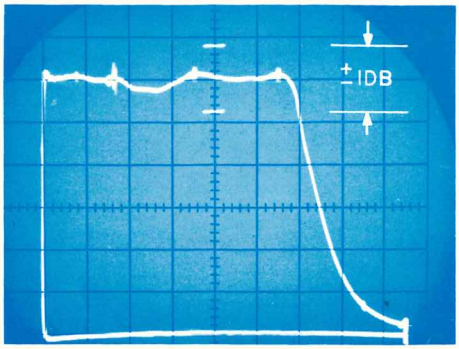
PUT EITHER AMPLIFIER TO WORK FOR YOU

20 and 40 db gain—for pulse or general purpose applications

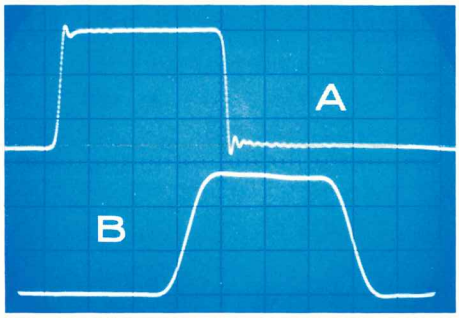


Model 461A, 462A Amplifiers

Whether you're interested in amplifying signals in the audio-to-vhf frequency range, *or* pulses, one of two new Hewlett-Packard amplifiers will likely suit your requirements. The model 461A is a *general purpose amplifier* with an essentially flat frequency response (±1 db from 500 kc reference) from 1 kc to 150 Mc, and an output of ½ v rms into a 50-ohm resistive load. The Model 462A is a *pulse amplifier* with faster than 4 nanosecond rise and fall times (overshoot less than 5%), and an output of 1 v p-p into a 50-ohm resistive load. Both amplifiers have 20 and 40 db gain, are compact and completely solid state, and have exceptional stability. You can buy either one for $325.



Typical frequency response curve of HP 461A Amplifier, with gain control set in 20 db or 40 db position. Markers from left to right are: 50, 100, 150, and 200 Mc.

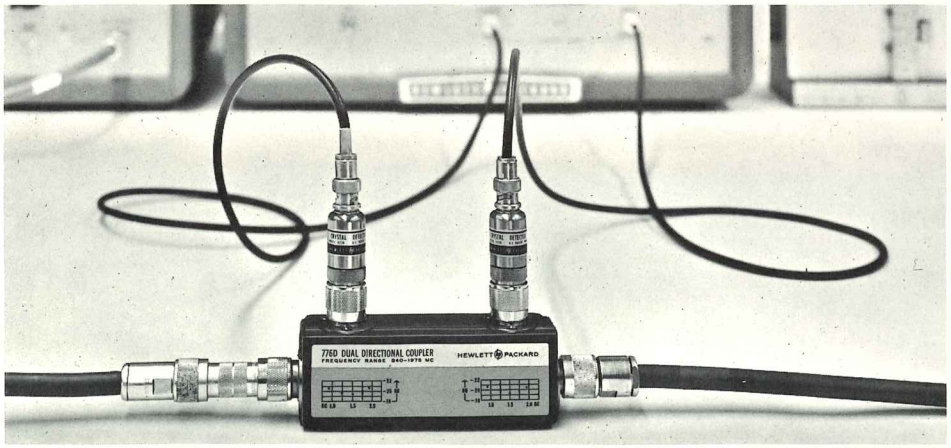


(A) Input pulse (5 mv p-p) to HP 462A Amplifier; (B) Output pulse (500 mv p-p). The gain control is set at 40 db, and sweep speed is 5 ns/cm.

HIGH DIRECTIVITY COAXIAL COUPLERS, 215-1900 MC

Coaxial swept reflectometer technique, time saver in the design and manufacture of broadband apparatus, is now simplified and made more accurate for you with three new HP 770 Series Dual Directional Couplers — all offering at least 40 db directivity. This extremely high directivity is equivalent to a residual swr error of only 1.02 and it provides accuracy in swept frequency reflectometer applications better than that of laborious point-by-point slotted line measurement techniques.

Their high power handling capacity (50 watts cw, 10 kw peak) and low insertion loss (approximately 0.15 to 0.25 db) also make these couplers useful for permanent installation in coax lines for power monitoring. The HP Model 774D (215 to 450 Mc), 775D (450 to 940 Mc), and 776D (940 to 1900 Mc) Couplers are priced at $200 each.



The new HP 770 Series Dual Directional Couplers have high directivity (at least 40 db), making them ideal for reflectometer applications in coaxial systems.

COMMUNICATORS, NOTE: SPECIAL PUSH-BUTTON TELEPHONE OSCILLATORS

Two special push-button oscillators have been recently developed by HP for telephone industry applications. Features common to both units include: frequencies from 100 cps to 10 kc, push-button selected with an absolute accuracy of ±0.2%; output terminals to match either 600- or 900-ohm lines; and output power adjustable over a 40-db range (+10 to −30 dbm) in 1 db steps, with an accuracy of 0.1 db. For portability, both oscillators operate from standard telephone-type positive-ground battery supplies: the Model H30-241A Oscillator ($675) on −30 vdc, and the Model H48-241A Oscillator ($650) on −48 vdc.

An extra measure of quality

BOONTON RADIO COMPANY
DYMEC
HARRISON LABORATORIES
HEWLETT-PACKARD COMPANY
F. L. MOSELEY COMPANY
SANBORN COMPANY

Data subject to change without notice. Price f. o. b. factory.

NEW ACCURACY
for true rms ac measurement!

unequalled crest factor for accurate measurement of noise and pulses

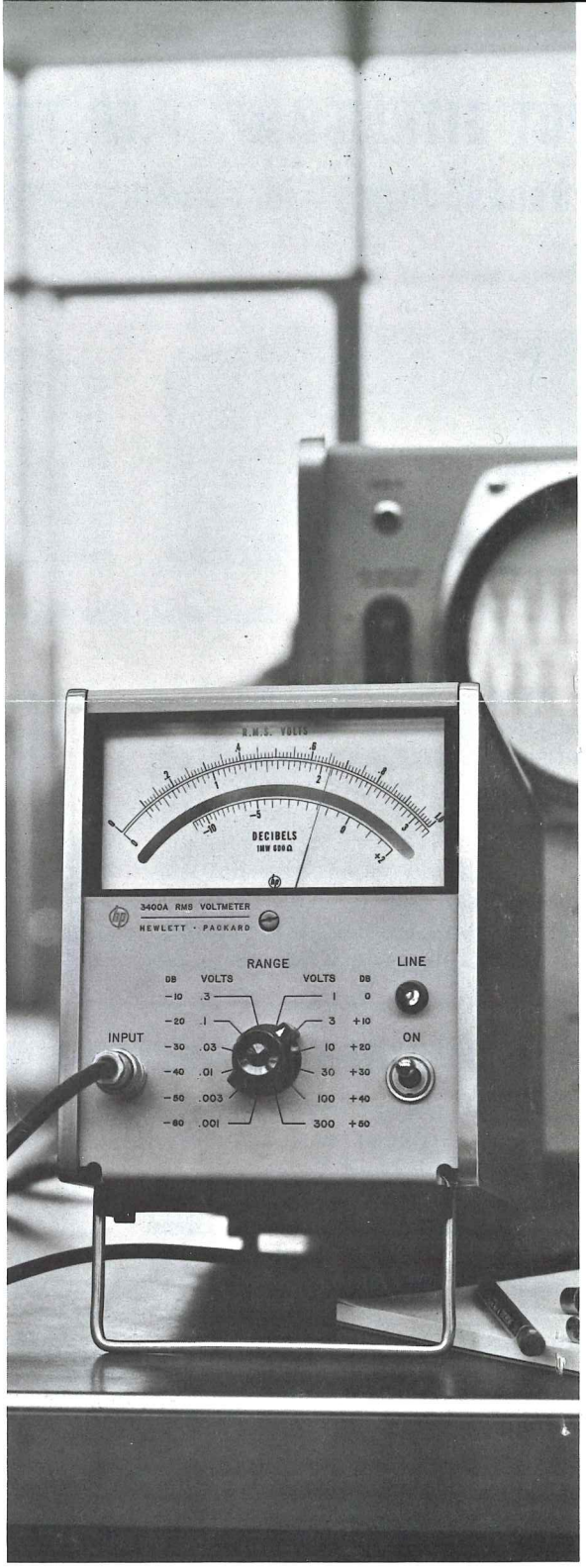
linear scale for excellent resolution, plus linear dc output

measures 100 μv to 300 v, −72 to +52 db, 10 cps to 10 mc

small, compact, easy to use, and costs only $525

With the new 3400A, true rms measurements can be made of non-sinusodial signals having crest factors (ratio of peak to rms) as high as 10 at full-scale over frequency range of 10 cps to 10 mc. This high crest factor increases for downscale readings, being inversely proportional to meter deflection. For greatest accuracy, 12 ranges in precise 10 db steps permit most readings to be taken on the upper two-thirds of the linear voltage scale.

Call us today for a demonstration and for all the details.



SPECIFICATIONS

Range:
100 μv to 300 v rms; 12 full scale ranges from 1 mv to 300 v in a 1, 3, 10 sequence; −72 to +52 db

Meter Scales:
voltage, 0 to 1 and 0 to 3; decibel, −12 to +2 db

Frequency Range:
10 cps to 10 mc

Accuracy:
within ±1% of full scale, 50 cps to 1 mc; ±2% of full scale, 1 mc to 2 mc; ±3% of full scale, 2 mc to 3 mc; ±5% of full scale, 10 to 50 cps and from 3 to 10 mc

Response:
responds to rms value (heating value) of the input signal for all waveforms

Crest Factor (ratio of peak amplitude to rms amplitude):
10 to 1 at full scale, inversely proportional to pointer deflection; e.g., 20 to 1 at half scale, 100 to 1 at tenth scale

Response Time:
typically < 2 sec to within 1% of final value for a step change

Overload Protection:
40 db or 425 v rms, whichever is less, on each range

Maximum Input:
425 v rms

Input Impedance:
10 megohms shunted by 25 pf

Output:
negative 1 v dc at full scale deflection, proportional to pointer deflection; 1 ma maximum; nominal source impedance is 1000 ohms.

Power:
115 or 230 v ±10%, 50 to 60 cps, approximately 7 watts

Dimensions:
5⅛" wide, 6½" high, 11" deep

Weight:
net 7¼ lbs.

Accessory Furnished:
10110A Adapter, BNC to dual banana jack

Price:
3400A RMS Voltmeter, $525

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